The asymptotic behaviour of the spectrum and of eigenfunctions of the Anderson-Hatano-Nelson model

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Abstract

We study the eigenvalue problem on finite intervals with periodic boundary conditions for non-Hermitian random Schrödinger operators with imaginary vector potentials in dimension one. We prove that the eigenvalues of the finite system are attracted by certain curves in the complex plane. An equation for these curves is derived and the density of non-real eigenvalues is obtained in terms of spectral characteristics of a reference Hermitian disordered system. This happens despite the fact that the spectrum of the limit operator in $l^2(\mathbf{Z})$ is a two dimensional set in the complex plane and thus is not approximated by the spectra in finite intervals. We also discuss the behaviour of the eigenfunctions of our system and the localization-delocalization transition phenomena